

7.1.4 Low-Slope Roofing

Roofing serves the vital function of protecting a building from the elements—such as precipitation, of course, but also unwanted heat and cold. Roofing must serve its protective function dependably, yet roofing materials are exposed to the harshest environment of any building component: harsh ultraviolet light, intense heat, plummeting nighttime temperatures, widely fluctuating moisture conditions, freeze-thaw cycles, damage from hail, and so forth. It is no wonder that most low-slope roofs last only 10 to 20 years. Vast quantities of roofing are installed on commercial buildings each year—most of it after failing roofing materials are removed. Only a tiny percentage of the old roofing removed each year is recycled. Even worse, with the most common type of commercial roofing, the rigid-foam roof insulation is destroyed in the process of reroofing. Among building materials, low-slope roofing is one of the most environmentally damaging, and greening the roofs of commercial buildings is among the most difficult challenges in environmentally responsible design and construction.

Opportunities

Environmental Building News estimates that there are 1,400 square miles (3,625 km²) of low-slope roofing (an area larger than the state of Rhode Island) on the nation's 4.8 million commercial buildings. Three-quarters of the roofing installed each year is reroofing installed on older buildings. While roofing choices must, of course, be considered during the design of new buildings, there will also be opportunities for installing more environmentally responsible products during reroofing rather than simply replacing a failed roof with more of the same. Be sure to consider the integration of roofing, roof insulation, cooling load avoidance, and moisture-control detailing with all reroofing jobs.

Technical Information

Consider the roof system as a whole. In new buildings consider, for example, whether the roofing and decking can be combined into one system. This is becoming an attractive option with some new low-slope, structural metal roofing systems that eliminate the need for roof decking.

Choose a protected-membrane roof. With a protected-membrane roof, the waterproof roof membrane is installed directly on the roof deck, then rigid-foam roof insulation is loose-laid on top, and the insulation is protected by ballast. This configuration both increases the roof membrane life by protecting it from UV exposure and allows the rigid insulation to be salvaged and reused during reroofing.

Specify nonhalogenated roof membranes. Polyvinyl chloride roof membranes are fire-resistant and durable, but in the event of a fully engaged building fire, toxic hydrochloric acid is produced as well as such persistent organic pollutants as dioxin. Some thermoplastic olefin (TPO) membranes gain their fire resistance with bromine, which may be as environmentally damaging as chlorine in the event of a fire. Often, nonhalogenated roof membranes can meet fire code only if they are covered with protective ballast (such as stone or concrete tile).



When the roof membrane was replaced on the Mount Washington Visitor Center in New Hampshire, the Styrofoam® insulation was able to be reused because it was a protected-membrane roof.

Source: Dow Chemical

GARDEN ROOF™

"EXTENSIVE" VEGETATION

SUBSTRATE SOIL

SYSTEMFILTER SF

FLORADRAIN 40

MOISTURE MAT SSM45

HYDRODRAIN

STYROFOAM®

ROOT STOP WSF 40

HYDROFLEX 30

MM6125-EV

SURFACE CONDITIONER



Source: Hydrotech

The Garden Roof system from Hydrotech and ZinCo offers a sophisticated collection of components for protecting the roof against moisture penetration, draining excess rainwater, retaining water for irrigating the roof, and keeping plant roots away from the roof membrane.

Integrate rainwater harvesting into the roof design. Rainwater can be collected off roofs for landscape irrigation, nonpotable uses (e.g., toilet flushing), and even—with proper treatment—potable uses. Collection of rainwater also helps reduce stormwater runoff and downstream flooding. See *Section 6.7 – Rainwater Harvesting*.

Consider a green roof. One of the most exciting options for a green building is a green roof—a roof that is planted with vegetation. These are increasingly being proposed both as a strategy for controlling stormwater runoff (they can detain as much as three-quarters of the rainfall from a storm) and for cooling urban heat islands. Planting roofs with native, drought-tolerant grasses or prairie vegetation is often the best environmental solution. Newly available European components are making green roofs more feasible than ever.

Select reflective roof membranes. The ENERGY STAR® Roof Products program labels low-slope roofing products with an initial reflectivity of 65% or higher and a three-year aged reflectivity of 50% or higher. There are now more than 100 partners in the program, including manufacturers of both low-slope and steep-slope roofing products. Reflective roofs can dramatically reduce heat gain in commercial buildings. They can also help to reduce the regional warming that occurs in urban areas with lots of roof area and pavement (the *urban heat island effect*).

Specify recyclable roofing whenever possible. Thermoplastic roofing products (PVC and TPO) are generally recyclable; ethylene propylene diene monomer (EPDM), bitumen, and modified bitumen generally are not.

Specify non-ozone-depleting roof insulation. Avoid polyisocyanurate or extruded polystyrene insulation unless the manufacturer can verify that it was not made with ozone-depleting HCFCs. Expanded polystyrene, some polyisocyanurate, and rigid mineral wool or fiberglass boardstock do not deplete ozone. Do not skimp on insulation levels.

Recycle old roofing. A few companies will recycle PVC and TPO roof membranes as well as polystyrene insulation removed during reroofing. When the recycling of roofing is required by Federal building specifications, additional options will become available for this more responsible means of disposal.

Consider using the roof for PV power generation. Several companies now produce roofing materials that are also photovoltaic panels. Building-integrated PV is growing tremendously, and roofing products are an obvious first choice. Most such products are designed for steep-slope roofing (PV shingles and standing-seam metal roofing with applied thin-film PV modules), but even low-slope roofing can be used for PV arrays (see *Section 5.8.5 – Photovoltaics* for more information).

References

GreenSpec: The Environmental Building News Product Directory and Guideline Specifications, BuildingGreen, Inc., Brattleboro, VT, 1999; (800) 861-0954; www.greenspec.com.

Wilson, Alex, "Low-Slope Roofing: Prospects Looking Up," *Environmental Building News*, Vol. 7, No. 10, November 1998, BuildingGreen, Inc., Brattleboro, VT; (800) 861-0954; www.BuildingGreen.com.

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